Rada Pulser-SR 5070B

KAY ELEMETRICS CORP

INSTRUCTION MANUAL

Issue B

February 1977

5150-7006

Pulsed Carrier Generator 5070B

We urge customers to use caution when operating or repairing an instrument. Use instruction manual for correct operating procedures and repair. Pay close attention to the decals on Kay's equipment where voltage is located. This is for your safety.

KAY ELEMETRICS CORP.
12 MAPLE AVENUE,
PINE BROOK, NEW JERSEY 07058
(201) 227-2000

KAY
Elemetrics Corp • 12 Maple Ave. • Pine Brook • New Jersey • 07058
FORMERLY KAY ELECTRIC COMPANY

Dear Customer:

We would like to maintain contact with the people who use or fix our instruments. Through our engineering and marketing research Kay is constantly discovering new and better ways to use our equipment. Often we have improvements, additions, refinements, new plug-ins, and other information which we would like you to know about.

Let's keep in touch. Please fill in the card below.

Very truly yours,

John M. Crump

John M. Crump
President

Note: All foreign customers should add appropriate postage. Thank you.

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Company/Institution TEXAS INSTRUMENTS

Division/Department 01 Equipment Group

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City, State, Zip DALLAS TEXAS

Country

Telephone 995-2717

Do you use this instrument?

Do you maintain or repair it? YES

Should we be doing something to help you?

5070

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Elemetrics Corp
12 Maple Avenue
Pine Brook, N.J. 07058

WARRANTY

Each new instrument manufactured and/or sold by us is warranted to be free from defects in material and workmanship. Our responsibility is limited to repairing (or replacing) any instrument, or part thereof, for a period of one year when, in our opinion, the repair or replacement is covered by this warranty.

KAY ELEMETRICS CORP.

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RATE ADJ
WIDTH ADJ
EXT MOD
EXT TRIGGER
SYNC OUT (POS)
PULSE OR RF OUT 50 Ω
PULSED RF
CW
OFF
VIDEO PULSE
RF OR PULSE LEVEL
PULSE RATE
EXT TRIGGER
EXT MOD
50
500
5KHz
PULSE WIDTH μ SEC
1
10
.1
100
ATTENUATOR (DB)
20
20
20
20
10
5
3
2
1
IN
EXT OSC
Radar-Pulser Jr.
PULSED CARRIER GENERATOR
5070 B
KAY
ELEMETRICS CORP
PINE BROOK N J

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OPERATION SECTION

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Rada-Pulser Sr. 5070-B is a fully transistorized pulsed-carrier generator; it provides sharp rise and decay times and flat tops. You can obtain pulsed r-f, video pulses, or c-w output from this instrument. The pulse widths are continuously variable from 100 ns to 100 μs, and the repetition rate can be varied from 50 to 5000 pps.

The pulsed r-f output is generated by an oscillator which is controlled by a pulse generator with a diode switch. The r-f output is held at the same peak levels during either c-w or pulsed r-f operation. The carrier pulses are flat (including overshoot) within $\pm$5% and the rise and decay times are less than 10 ns. The output level can be varied to a maximum of 0.5 volt rms into 50 ohms. The carrier-off level is greater than 70 db (to 85 db) below the carrier level, within the normal frequency range of the instrument. The diode switch, in addition to being driven by the internal pulse generators, can be driven by any external source. An input pulse of approximately 2 volts will trigger the 5070-B, in either pulsed-carrier or video-pulse mode. The video-pulse generator provides the same range of pulse width as the pulsed carrier, and width rise and decay times of less than 20 ns. In this function, you can obtain a maximum output of $\pm$3 volts into a 50-ohm load. A sync pulse is available which precedes the output by 40 ns.

During c-w operation, the 5070-B will generate a signal, continuously variable, from 10 to 120 mc in five overlapping bands. A 101 db step attenuator is included in the instrument enabling comparative output measurements to be made on an oscilloscope. The unit also has a variable gain control, having a range of 6 db, providing a continuous range of attenuation. The output amplitude during c-w is monitored by a front-panel meter.

1.2 INSTALLATION

Unpacking: Upon receipt of the instrument, visually inspect it for any damage that might have occured during shipment. Please report any damage to the carrier and to the Kay Electric Company.

Installation: Designed as a bench top unit, the 5070-B may be removed from its cabinet and be mounted in a standard 19 inch relay rack. The electronically regulated power supply operates from 117 VAC line voltage.

Operating Notes: The 5070-B is designed for general use, in an environment reasonably constant in temperature and humidity. Adequate air circulation is provided by the cabinet's ventilating grating, as long as it is not obstructed. In any test operation using this instrument, impedance matching devices should be used where input and output impedances differ substantially. Also, the exclusive use of coaxial or shielded cabling and connectors will prevent stray pick-up.

1.3 SPECIFICATIONS

Frequency Range:	10 to 120 mc with a direct reading dial in 5 overlapping ranges. Dial accuracy is ±1%.
Output Amplitude:	CW - 0.5V rms into 50 ohms; Pulsed R-F Carrier Level - 0.5V into 50 ohms; Video Pulse - ±3V peak into 50 ohms.
Carrier-Off Level:	85 dB to 30 mc, 80 dB to 70 mc, 70 dB to 120 mc.
Pulsed Carrier Rise & Decay Times:	Less than 10 ns.
Video Pulse Rise & Decay Times:	Less than 20 ns.
Pulse Repetition Rate:	50 pps to 5000 pps.
Pulse Width:	100 ns to 100 μs.
Attenuator:	101 dB in 1 dB steps plus approximately 6 dB variable.
Sync Output:	2.5V peak into a high impedance with 20 ns rise time. Sync pulse precedes the output pulse by approx. 40 ns.
External Trigger Input:	Approximately a -2V pulse.
Power Supply:	117V ± 10%, 50-60 cps. (or 220 V ± 10% 50-60 cps. if primary leads are properly connected.) Power consumption approx. 30W. All supply voltages electronically regulated.

SECTION II

CHECK OUT PROCEDURE

2.1 FRONT PANEL CONTROLS

CONTROL	POSITION	FUNCTION
Selector Switch	OFF	The unit is completely shut off.
	CW	A c-w signal is available at the PULSE or RF OUT jack.
	PULSED RF	A pulsed carrier is available at the PULSE or RF OUT jack.
	+ VIDEO PULSE	A +3 volt video pulse is available at the PULSE or RF OUT jack.
	- VIDEO PULSE	A -3 volt video pulse is available at the PULSE or RF OUT jack.
Frequency Selector	COARSE	Selects either frequency range or external oscillator input.
	FINE	Enable continuous tuning of the desired band.
RF OR PULSE LEVEL	Variable	Provides variable attenuation of CW, PULSED RF, or VIDEO PULSE output. Range is approximately 6 db.
PULSE RATE	EXT MOD	A positive pulse of about 2 volts will turn the pulsed rf on; zero volts will shut it off. The input impedance is nominally 50 ohms, and the circuitry is d-c coupled permitting the use of extremely long pulses. The external modulation controls both the repetition rate and width of the pulsed carrier.
	EXT TRIGGER	Permits external control of the pulse repetition rate only. It requires approximately a -2 volt pulse for triggering.
	50 - 500 500 - 5 kc	These positions select the range of pulse repetition rates. The RATE ADJ control permits full variation.
PULSE WIDTH	.1 - 1.0 μs 1.0 - 10 μs 10 - 100 μs	These positions select the range of pulse widths. The WIDTH ADJ control permits full variation.
Attenuator	Switchable	Provides 101 db of attenuation in 1 db steps.

2.2 FRONT PANEL TERMINALS

TERMINAL	FUNCTION
EXT OSC	Permits the use of an external oscillator, when the Frequency Selector is in the EXT OSC position. This jack presents an impedance of 50 ohms; signals from 5 to 130 mc at .35 volts rms may be used. When not in use, the external oscillator should be removed.
EXT MOD	Permits the use of external modulation, when the PULSE RATE switch is in the EXT MOD position.
EXT TRIGGER	Permits the use of external triggering, when the PULSE RATE switch is in the EXT TRIGGER position.
SYNC OUT (Pos)	Provides a high-impedance sync pulse output. The pulse is +2.5 volts peak, and has a rise time of approximately 20 ns.
PULSE OR RF OUT (50 ohm)	Supplies c-w, pulsed rf, or video pulses into a 50 ohm load.

2.3 CHECK OUT PROCEDURE

A. FREQUENCY RANGE

1. Place the FUNCTION SELECTOR in the CW position.
2. Use a frequency counter to check that the dial accuracy is within $\pm 1\%$ over the entire range of the unit.

B. PULSE RATES

1. Connect the PULSE or RF OUT jack to an oscilloscope making sure that the cable used is 50 ohm cable and that it is terminated at the scope in 50 ohms.
2. Switch to a VIDEO PULSE position, place the PULSE RATE switch in the 50 to 500 pps position and check to see that the oscilloscope indicates this range.
3. Place the PULSE RATE switch in the 500 to 5000 pps position and check to see that the oscilloscope indicates this range.

C. EXTERNAL INPUTS

1. Place the FUNCTION SELECTOR in the EXT MOD position.
2. Connect the output of a pulse generator to the EXT MOD jack and provide pulses of +2 volts peak.
3. See that the rate and width are both externally controlled.
4. Place the PULSE RATE switch in the EXT TRIGGER position and feed in pulses to the EXT TRIGGER jack.
5. See that the pulse rate is controlled by the external trigger input and the pulse width by the PULSE WIDTH and WIDTH ADJ controls.

D. VIDEO PULSES

1. Check each video pulse position for the following: pulse rate, pulse width, amplitude, rise and fall time, and pulse overshoot.
2. Consult the alignment procedure for corrective measures if any pulse characteristic does not meet specifications.

MAINTENANCE SECTION

PARTS LIST

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 — Dwg. No. D9846 L

Instrument: Rada-Pulser Sr. — Model No, 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ — Page 1

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Capacitors: (All capacitors in pf, 500 volts, unless otherwise indicated)			
C1, 16, 36	300, Silver Mica	0141-0026	Elmenco Dm15-301
C2	.02uf, 100V, Ceramic Disc	0150-0009	Gulton MIN-V-.02-Z
C3, 4, 11, 12, 14, 17, 19, 22, 23, 26, 30, 36, 39, 45, 50	4000, Ceramic Feed Thru	0160-0011	Erie X5V2443-40000GMV
C5, 10	470, 1KV, Ceramic Disc	0152-0005	Elmenco
C6, 9	5, Silver Mica	0141-0004	Elmenco DM15-050
C7, 8	3.5 - 31.5, Variable	7083-3700	Kay Elemetrics Corp
C13	.Oluf, Ceramic Disc	0150-0008	Sprague CK63AW103M
C15	2, Silver Mica	0141-0001	Elmenco DM15-020
C18, 37, 76	.05uf, 100V, Mylar-Paper	0142-0015	Elmenco 1DP-2-503
C20, 24, 27, 77	.22uf, 50V, Mylar	0167-0002	Goodall 601PR 84411
C21, 56	.001uf, 600V, Mylar-Paper	0142-0001	Elmenco 6DP-1-102
C25, 26, 57	200, Silver Mica	0141-0024	Elmenco DM15-201
C29	3, Ceramic Feed Thru	0341-0006	CTC #1990
C31	100uf, 6V, Electrolytic	0180-0007	Sprague 40D107006DPO
C32	50pf, Silver Mica	0141-0021	Elmenco DM15-121
C33, 52, 53	7-45, Ceramic Trimmer	0130-0017	Erie 503000 D2PO 33R
C34, 36, 44, 51	22uf, 15V, Electrolytic	0180-0013	Texas SCM226BP015D2
C40	15, Silver Mica	0141-0008	Elmenco DM15-150
C41	.1uf, Ceramic Disc	0150-0012	Sprague CK63AW103M
C42	90uf, 6V, Non Polarized		Kemet 65268SU
C43	47uf, 20V, Electrolytic	0180-0024	G.E. 76F02KK470
C46	Factory Selected		
C47	150uf, 15V, Electrolytic	0180-0015	Sprague 40D157F015DH3
C48, 49	1000, Ceramic Feed Thru	0160-0007	Erie X5V2443-1000GMV

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 — Dwg. No. D9846L

Instrument: Rada-Pulser Sr. — Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ —

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Capacitors: (cont.) All capacitors are in pf, 500 volts, unless other wise indicated)			
C54	68, Silver Mica	0141-0016	Elmenco DM15-680
C55	.Oluf, 100V, Mylar-Paper	0142-0008	Elmenco 1DP-1-103
C58, 61	.1uf, 100V, Mylar-Paper	0142-0019	Elmenco 1DP-2-104
C59, 60	.82uf, 35V, Electrolytic	0180-0042	Kemet KR82J35K5
C75	5.5 - 18pf Variable	0130-0006	Erie 538-000-A515-18
C62	.2uf, 100V, Electrolytic	0150-0013	Erie 8131-100-651-204Z
C63, 71	1000uf, 50V, Electrolytic	0180-0059	Sprague TVL-1338
C64, 72	25uf, 25V, Electrolytic	0180-0028	Sprague 40D256F025DD3
C65, 73	250uf, 25V, Electrolytic	0180-0036	Cornell Dubilier BR250-25
C66, 74	50uf, 25V, Electrolytic	0180-0030	Cornell Dubilier BR50-25
C67	250uf, 50V, Electrolytic	0180-0057	Cornell Dubilier BR250-50
C68	22uf, 35V, Electrolytic	0180-0045	Texas Type SCM
C69	2.2uf, 50V, Electrolytic		G.E. 76F026C2R2
C70	30uf, 50V, Electrolytic		G.E. 76F02KF330
Diodes			
D1 thru D12	1N82A, Silicon Point Contact	1900-0001	Silvania 1N82A
D13 thry D18, 23	F6, Silicon Rectifier	1908-0007	Sarkes Tarzian F6
D19, 24	1N4742, Zener, 12 volts	1902-0029	Motorola 124742
D20	1N461 Silicon	1901-0008	Motorola 1N461
D21	1N4736, Zener, 6.8 volts	1902-0026	Motorola 1N4736
D22	1N936, Zener, 9 volts	1902-0003	Motorola 1N936
F1	Fuse, .3 amp Slow Blow 1/2 amp	2110-0010	Little fuse
L1	Lamp, Bayonet, #44	2140-0004	General Electric #44

Fpg 1.5

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 — Dwg. No. D9846L

Instrument: Rada-Pulser Sr. — Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ — Page 3

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Connectors:			
J1, 3, 4, 5, 6, 8	UG625/U, Coax	1250-0008	Dage, UG625/U
J2	UG291A/U, Coax	1250-0006	Dage, UG291A/U
J7	UG185/U, Coax	1250-0003	Dage, UG185/U
J9	UG535/U, Coax	1250-0007	Dage, UG535/U
Coils:			
L1, 2, 3, 4, 5, 6, 9,	Special, Slug-Tuned		Kay Elemetrics Corp
L7, 8, 10, 11	12uh, choke	9100-0012	Jeffers 4421-8K
M1	Meter, 0-.5V RMS	7080-5000	Kay Elemetrics Corp
Plugs:			
P1	AC Line cord w/plug	8120-0003	Belden 17405
P5, 6, 7, 9	UG88/U, Coax BNC	8250-0002	Dage, UG88/U
Transistors:			
Q1, 2	2N3866 (5) Silicon NPN	1854-0112	Vector 2N3866
Q5, 8, 11	2N2270 Silicon NPN	1854-0004	RCA 2N2270
Q7	2N3566 Silicon NPN	1854-0008	Fairchild 2N3566
Q9	MM1941 Silicon NPN	1854-0102	Motorola MM1941
Q10, 18	2N6225 Silicon NPN	1860-0012	G.E. 2N6225
Q12, 13, 19	2N3568 Silicon NPN	1854-0009	Fairchild 2N3568
Q14, 15, 17	2N3866 (6) Silicon NPN	1854-0013	Vector 2N3866

COMPLETE REPLACEABLE PARTS LIST

Date February 1977

Dwg. No. D9846L

Instrument: Rada-Pulser Sr.

Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Transistors (cont.)			
Q16	40894 Silicon RCA	1854-0122	RCA 40894
Q20, 21	2N1701 Silicon NPN	1854-0202	RCA 2N1701
Q22	2N3740 Silicon NPN	1853-0201	Motorola 2N1183
Q14	2N3553 Silicon NPN	1854-0207	RCA 2N3553
Resistors: (Unless otherwise specified, all components are fixed composition, 1/2 watt 10% tolerance.)			
R5, 9, 16, 31, 37 46, 59, 100	100	0688-0031	Allen Bradley CB1011
R7, 8, 24, 28, 32, 41, 55, 73, 95	10	0688-0012	Allen Bradley EB1001
R10, 15, 96	10K	0688-0073	Allen Bradley CB1031
R11, 13, 76	68	0688-0027	Allen Bradley CB 6801
R12, 14, 99	2.2K	0688-0059	Allen Bradley CB2221
R17, 18, 22, 23, 35, 36, 48	220	0688-0038	Allen Bradley CB2211
R19, 45, 51	47	0688-0023	Allen Bradley CB4701
R20, 54, 74, 81	1.8K	0688-0057	Allen Bradley CB1821
R21, 58	18	0688-0015	Allen Bradley CB1801
R26, 29, 40, 42, 60, 72, 121	2.7, 1/2 watt, 5% tol.	0688-0004	Allen Bradley EB27G5
R27, 65, 75	390	0688-0043	Allen Bradley CB3911
R30, 38	820	0688-0051	Allen Bradley CB8211
R33, 89, 98	1K	0688-0053	Allen Bradley EB1021
R34	250, 1/2 watt, pot. Var.	2100-0027	CTS RA3806
R39	3.9K	0688-0006	Allen Bradley CB3921
R43	330	0688-0042	Allen Bradley CB

COMPLETE REPLACEABLE PARTS LIST

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Instrument: Rada-Pulser Sr. | Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ | Page 5

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Resistors: (cont.) Unless otherwise specified, all components are fixed composition, 1/2 watt 10% tolerance.			
R44	FACTORY SELECTED		
R47	100, 2 watt, pot., var.	2100-0009	Allen Bradley 70A4N0485101
R49, 63	680	0688-0049	Allen Bradley CB6811
R50	56	0688-0025	Allen Bradley
R52	33	0688-0020	Allen Bradley CB3301
R53	FACTORY SELECTED		
R56	180	0688-0036	Allen Bradley EB1811
R57	27	0688-0018	Allen Bradley CB2701
R61	51, 1 watt	0688-0024	Allen Bradley CB5101
R62	FACTORY SELECTED		
R64, 110	3.3K	0688-0062	Allen Bradley CB3321
R66	12	0688-0013	Allen Bradley CB1201
R67	FACTORY SELECTED		
R68, 80	3K	0688-0061	Allen Bradley CB3021
R69	2K, 2 watt pot, var.	2100-0064	Allen Bradley JA2N048S202UE
R106	27K 1/2 watt	0688-0081	Allen Bradley EB2731
R70	50K, 2wattpot, var.	2100-0125	Allen Bradley 70A4N048S503U
R71	39K	0688-0021	Allen Bradley CB3931
R77	15K, 2 watt pot, var.	2100-0108	Allen Bradley 70A4N048S153U
R78, 112, 114, 83	2.7K	0688-0060	Allen Bradley EB2721
R79	10K, 2 watt, pot, var.	2100-0093	Allen Bradley 70A4N048S103U
R82	5K, 1/2 watt, pot, var.	2100-0079	CTS PH4911
R84	1K, 1/2 watt, pot, var.	2100-0053	CTS PH4910
R86, A& B	25K, 2 watt, Dual pot	2100-0120	Allen Bradley JD2N048S253UE
R86, 87	50, 2 watt, pot, var.	2100-0167	Allen Bradley 70A4N048S500U
R88, 107	22K	0688-0080	Allen Bradley EB2231

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Instrument: Rada-Pulser Sr.

Model No. 5070-B

Mfg. by Kay Elemetrics Corp. Pine Brook, NJ

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Resistors: (cont.) Unless otherwise specified, all components are fixed composition, 1/2 watt 10% tolerance.			
R99, 119, 120	470	0688-0045	Allen Bradley EB4711
R91	8.2K	0688-0071	Allen Bradley EB8221
R92	9.1K, 1/2 watt, 5% tol.	0688-0072	Allen Bradley EB9125
R93, 94	20K	0688-0079	Allen Bradley EB2031
R97	500, 2 watt, pot, var.	2100-0032	Allen Bradley 70A4N048S501U
R101, 118	5, 5 watt, w/w	0664-0002	Ward Leonard 5x10
R102	390, 1 watt	0690-0019	Allen Bradley GB3911
R103	240, 1 watt	0690-0016	Allen Bradley GB2411
R104	20, 10 watt w/w	0665-0005	Ward Leonard 10x20
R105	10, 2 watt	0693-0003	Allen Bradley HB1001
R108	5.6K	0668-0067	Allen Bradley EB5621
R109	1.2K	0688-0054	Allen Bradley EB1221
R111	3.9, 1/2 watt, 5% tol.	0688-0063	Allen Bradley EB39G5
R113	1K, 2 watt pot, var.	0688-0053	Allen Bradley 70A4N048S102UE
R115	10, 5 watt, w/w	0664-0003	Ward Leonard 5x10
R116, 117	91, 1 watt	0690-0011	Allen Bradley GB9101
Switches:			
S1 A thru D	Rotary, 4 wafer, 5 position	7097-7200	Kay Elemetrics Corp
S1 E	Toggle, DPDT	3101-0002	Kay Elemetrics Corp
S2	Rotary, 3 wafer, 4 position	7083-1000	Kay Elemetrics Corp
S3	Rotary, 2 wafer, 3 position	7083-1100	Kay Elemetrics Corp
S4	Rotary, Turret	7083-0900	Kay Elemetrics Corp
T1	Transformer, power	9105-0010	Kay Elemetrics Corp

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 — Dwg. No. D9846L

Instrument: Rada-Pulser Sr. — Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ — Page 7

Drawing/ Symbol No.	Description	Kay Parts No.	Mfr. & Mfrs. Designation
Parts List, P.C. Board			Dwg. No. C8039-2
Capacitors: (All capacitors in pf, 500 volts, unless otherwise indicated.)			
C201, 209, 212, 217	.Oluf, 100V, Mylar-Paper	0142-0008	Elmenco 1DP-1-103
C206	.Oluf, 600V, Mylar-Paper	0142-0001	Elmenco 6DP-1-102
C207	50 Silver Mica	0141-0014	Elmenco DM15-500
C208, 211	.02uf, 100V, Mylar-Paper	0141-0011	Elmenco 1DP-1-203
C213, 214	500, Silver Mica	0141-0029	Elmenco DM15-501
C215	10, Silver Mica	0141-0006	Elmenco DM15-100
C216	5, Silver Mica	0141-0004	Elmenco DM15-050
C218	120, Silver Mica	0141-0006	Elmenco DM15-121
C219	.Oluf, 100V Mylar-Paper	0142-0019	Elmenco 1DP-2-104
Diodes:			
D201, 203, 219	Diode, Germanium, 1N126A	1910-0003	Erie 1801 ED 1N126A
D202	Diode, Germanium, 1N456	1901-0005	General Instrument
Transistors:			
Q203	Transistor 2N961, Germ PNP	1850-0100	Motorola
Q201, Q202	Transistor 2N3638A PNP Silicon	1860-0009	Fairchild 2N3638A
Q204	Transistor 2N961	K152	Motorola 2N961
Q205	Transistor 2N961	K152	Motorola 2N961
Q206	Transistor 2N961	K152	Motorola 2N961
Q207	Transistor 2N965	K150	Motorola 2N965
Q208	Transistor 2N706A	K154	Motorola 2N706A

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 — Dwg. No. D9846L

Instrument: Rada-Pulser Sr. q — Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ — Page 8

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
Resistors:			
R201	22, 1/4 watt	2201-C	Allen Bradley CB2201
R202	470, 1/2 watt	4711-E	Allen Bradley EB4711
R203	5K, 1 watt, pot., w/w	9122-27	IRC Type 100-1
R204	Not Used	------	----------
R205	470, 1/2 watt	4711-E	Allen Bradley EB4711
R206	2.2K, 1/4 watt	2221-C	Allen Bradley CB2221
R207	22, 1/4 watt	2201-C	Allen Bradley CB2201
R208	1K, 1/4 watt	1021-C	Allen Bradley CB1021
R209	15K, 1/4 watt	1531-C	Allen Bradley CB1531
R210	22, 1/4 watt	2201-C	Allen Bradley CB2201
R211	680, 1/2 watt	6811-C	Allen Bradley EB6811
R212	100, 1/4 watt	1011-C	Allen Bradley CB1011
R213	270, 1/4 watt	2711-C	Allen Bradley CB2711
R214	68K, 1/4 watt	6831-C	Allen Bradley CB6831
R215	10, 1/4 watt	1001-C	Allen Bradley CB1001
R216	390, 1/4 watt	3911-C	Allen Bradley CB3911
R217	22, 1/4 watt	2201-C	Allen Bradley CB2201
R218	Not Used	------	----------
R219	470, 1/2 watt	4711-E	Allen Bradley EB4711
R220	470, 1/4 watt	4711-C	Allen Bradley EB4711
R221	47K, 1/4 watt	4731-C	Allen Bradley CB4731
R222	680, 1/2 watt	6811-E	Allen Bradley EB6811
R223	1K, 1/4 watt	6811-C	Allen Bradley CB1021
R224	Not Used	------	----------
R225	470, 1/4 watt	4711-C	Allen Bradley CB4711
R226	12K, 1/2 watt	1231-E	Allen Bradley EB1231
B227	22, 1/4 watt	2201-E	Allen Bradley EB2201

COMPLETE REPLACEABLE PARTS LIST

Date February 1977 | Dwg. No. D9846L

Instrument: Rada-Pulser Sr. | Model No. 5070-B

Mfg. by Kay Elemetrics Corp, Pine Brook, NJ | Page 9

Drawing/ Symbol No.	Description	Kay Part No.	Mfr. & Mfrs. Designation
R228	220, 1 watt	2211-G	Allen Bradley GB2211
R229	270, 1/4 watt	2711-E	Allen Bradley EB2711
R230	1.2K, 1/4 watt	1221-C	Allen Bradley CB1221
R231	Not Used	------	----------
R232	220, 1 watt	2211-G	Allen Bradley GB2211
R233	Not Used	------	----------
R234	Not Used	------	----------
R235	1.2K, 1/4 watt	1221-C	Allen Bradley CB1221

SCHEMATICS

Output Amplifiers

The output of the diode switch is fed into a potentiometer which continuously adjust the RF level over a 6 db range. The signal now feed into the first RF amplifier which supplies about 10 db voltage gain. The signal now goes into an emitter follower to provide the necessary power gain. In the dideo pulse operation, the signal is switched to a video pulse amplifier to provide the necessary power out. The CW, Pulsed RF or Video Pulse then passes through a 101 db attenuator to the PULSE or RF OUT jack. The output of the emitter follower is detected and displayed on the front panel meter.

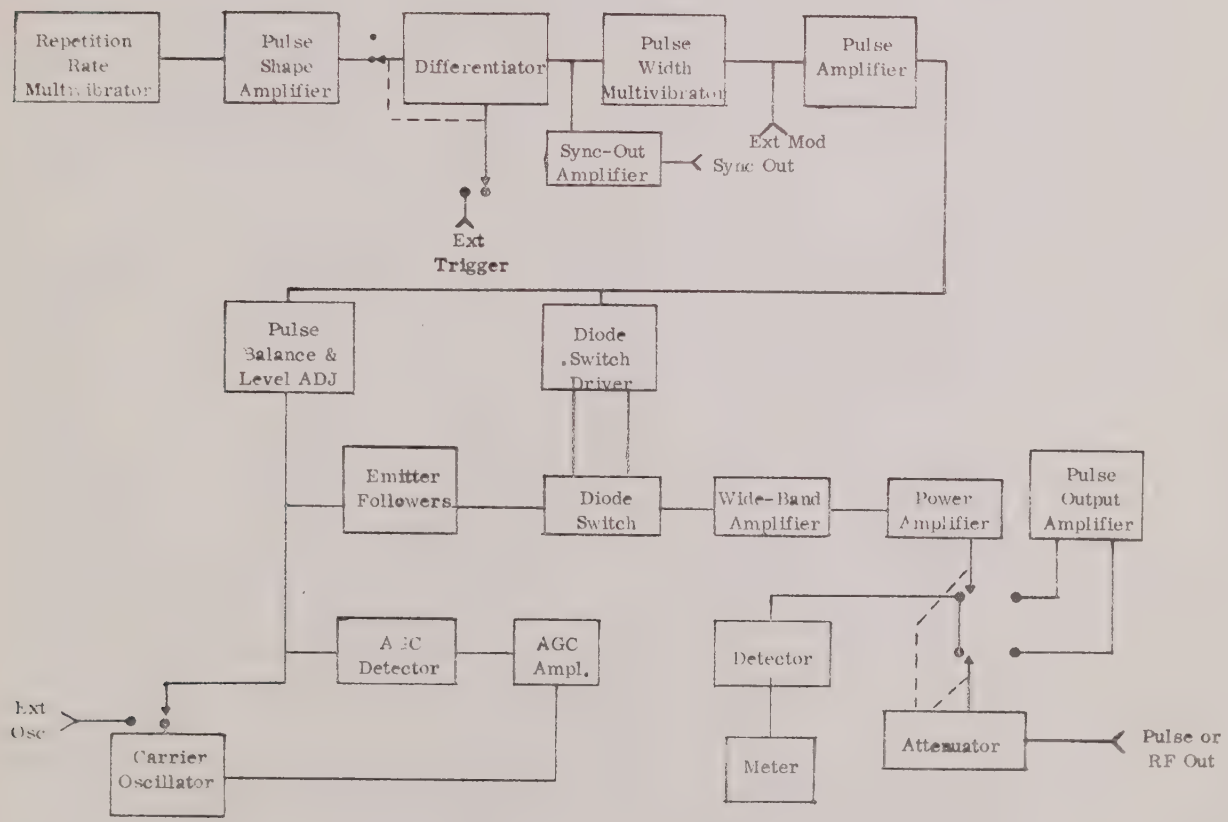


FIG. 3.1 BLOCK DIAGRAM

SECTION III

CIRCUIT DESCRIPTION

3.1 INTRODUCTION

This section contains information on how the 5070-B functions electrically. This description will be useful when the operator is making operational checks of the instrument or is trouble-shooting it to find a particular malfunction.

3.2 CIRCUIT DESCRIPTION

The first stage of the pulse generator is an astable multivibrator whose repetition rate is variable from about 50 cps to 5000 cps in two ranges, each range using different timing capacitors, but the same potentiometers for controlling repetition rate. This followed by a pulse amplifier to sharpen the rise and fall times of the Repetition Rate Multivibrator and to act as a buffer. The pulse is then differentiated through a diode-capacitor network and fed to the Pulse Width Multivibrator. The Pulse Width Multivibrator is a monostable multivibrator. The width of the quasi-stable state is variable from 100 ns to 100 μs in the ranges of 100 ns to 1 μs, 1 μs to 10 μs, and 10 μs to 100 μs, each range using a different timing capacitor but the same potentiometer for controlling pulse width. This multivibrator may be triggered by an external source.

The Pulse Width Multivibrator is followed by a pulse amplifier to sharpen the rise and fall times of the pulse. This is followed by another pulse amplifier supplying more power while sharpening the rise and fall times and controlling the amplitude of the pulse. This amplifier may be controlled by an external modulation. The Sync Out amplifier is a pulse amplifier and preceeds the Pulse Width Multivibrator. It supplies a positive 2.5 volt spike of about 10 ns rise time and preceeds the pulse or r-f output by about 40 N Sec.

Carrier Oscillator and Isolation Amplifiers

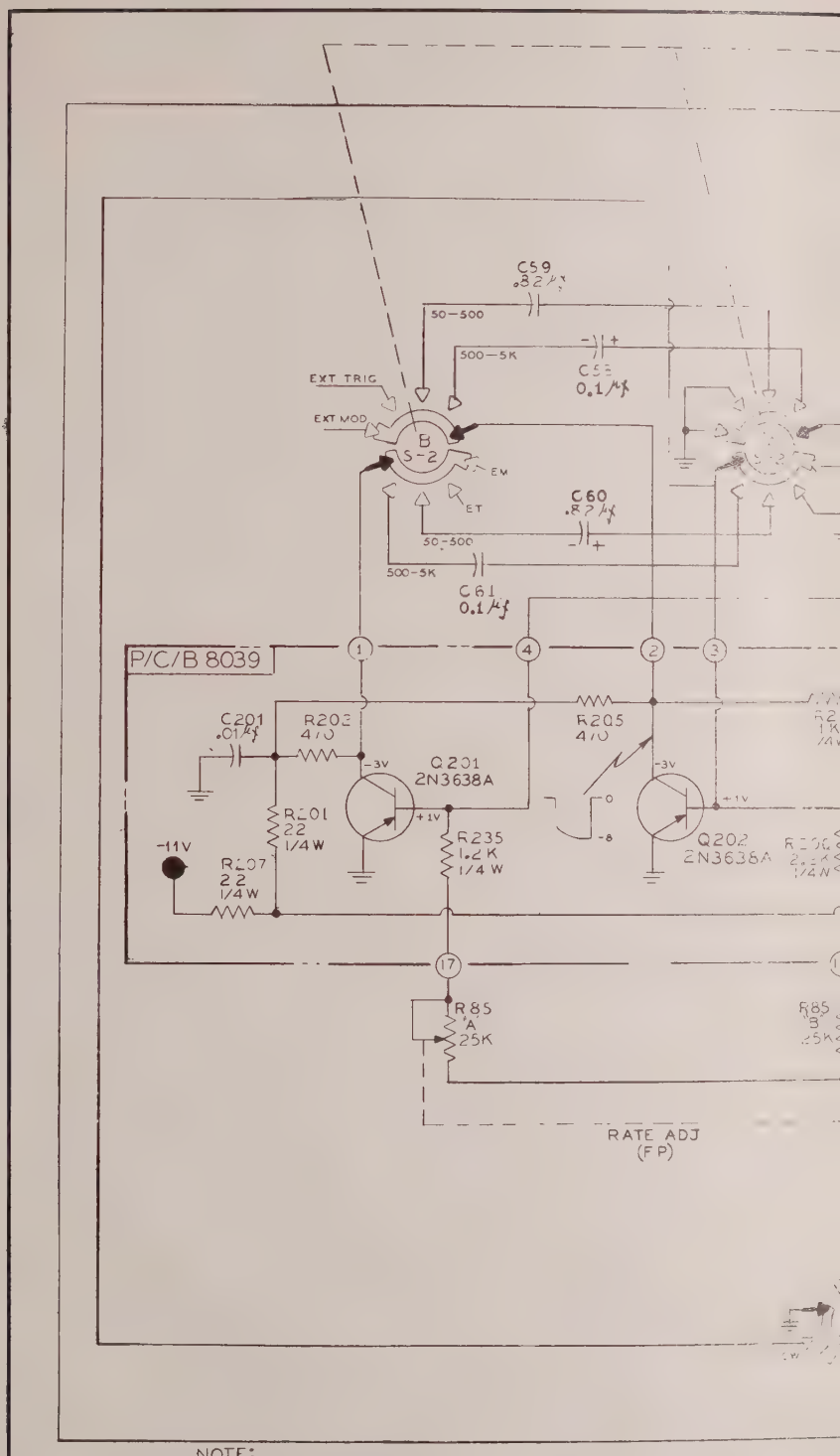
The carrier oscillator is a transistorized push-pull oscillator producing a large and stable waveform with low distortion. The oscillator is variable from 10 mc to 120 mc in five overlapping ranges. This is followed by two emitter followers, isolating the oscillator from the rest of the circuitry, so that the frequency sill remain stable and the output level constant.

AGC

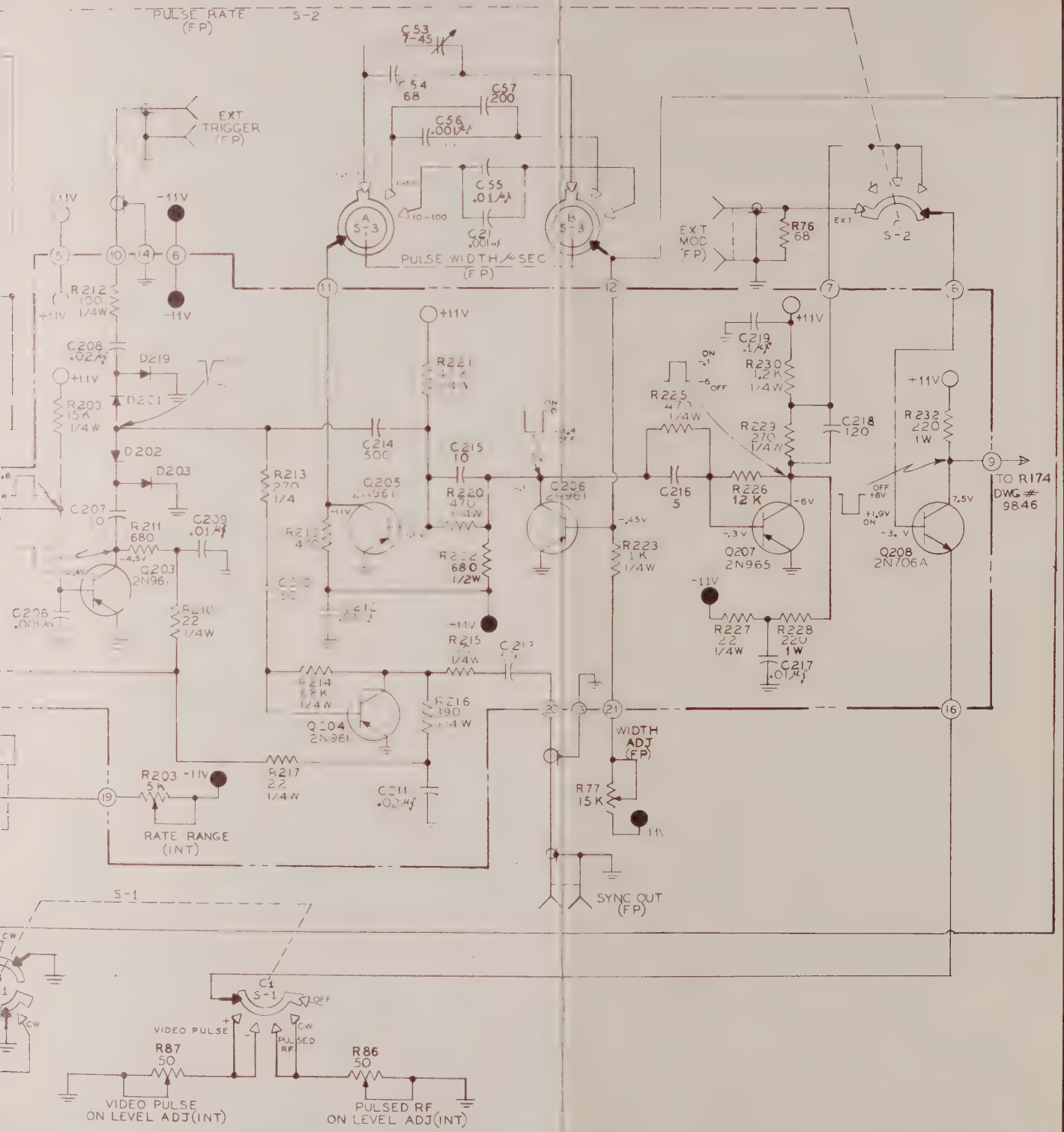
The AGC Detector is a diode doubler and monitors the RF level at the isolation stages. The RF voltage is detected at this point, amplified through high gain DC amplifiers and controls the oscillator level by varying the bias voltages on the oscillator. This also aids in stabilizing frequency and reducing distortion.

Diode Switch and Driver

The diode switch is a balanced diode modulator consisting of two sets of diode networks, so that the pulsed RF will be of equal amplitude above and below ground level. The switch receives the RF from the second isolation emitter follower and is gated on and off by the diode switch driver which receives a signal from the pulse generator.



NOTE:
FOR MAIN SCHEMATIC
SEE DWG NO D9846



NOTE: UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/2 W
ALL CAPACITANCE ARE IN µf
(2) INDICATES EGRESS HOLES
(FP) INDICATES FRONT PANEL

P/C/B SCHEMATIC — RADA-PULSER, SR. 5070B

MAT. — FINISH: — SCALE: —

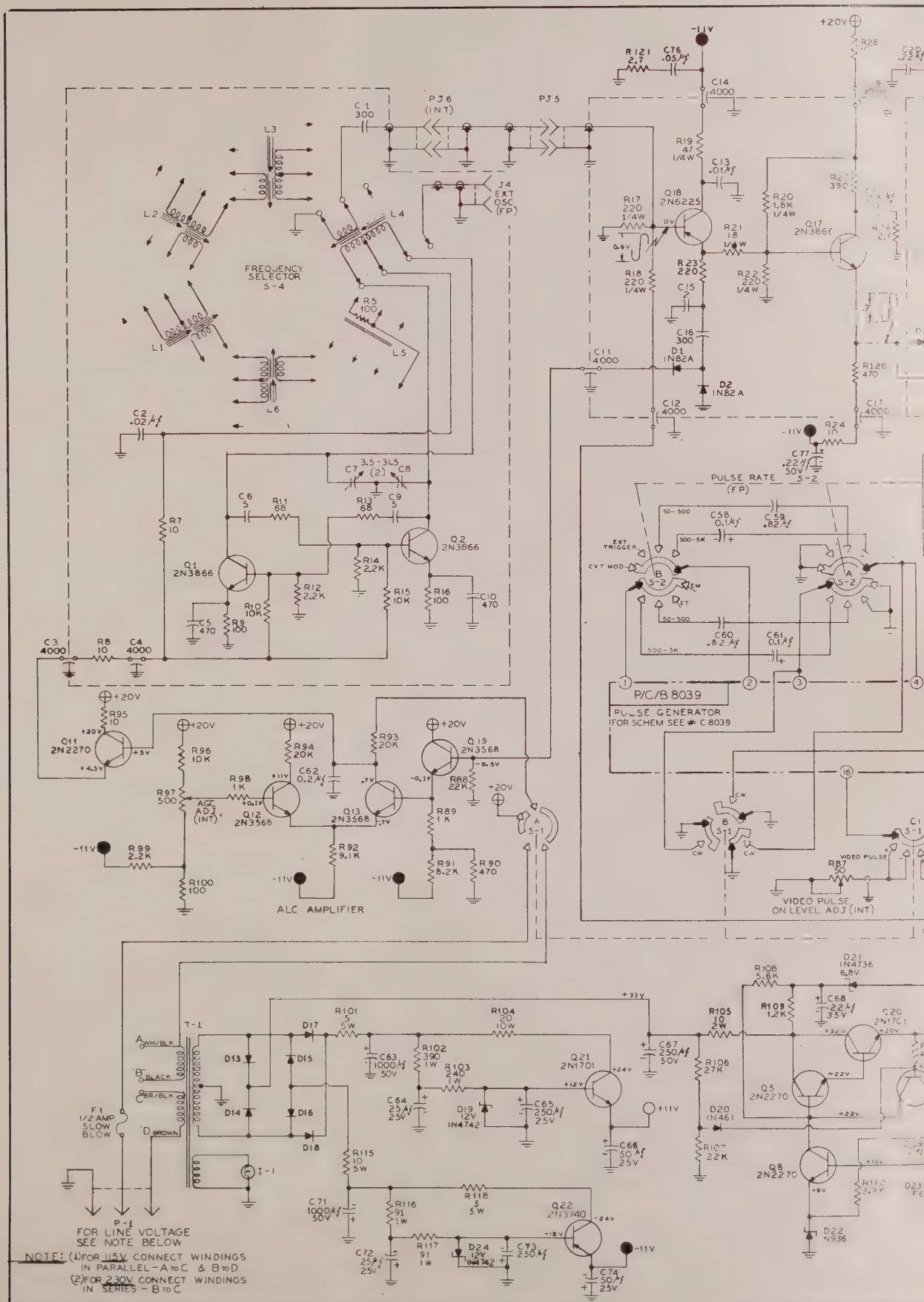
TOLERANCES UNLESS OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64 ANGULAR ± 30 MIN.

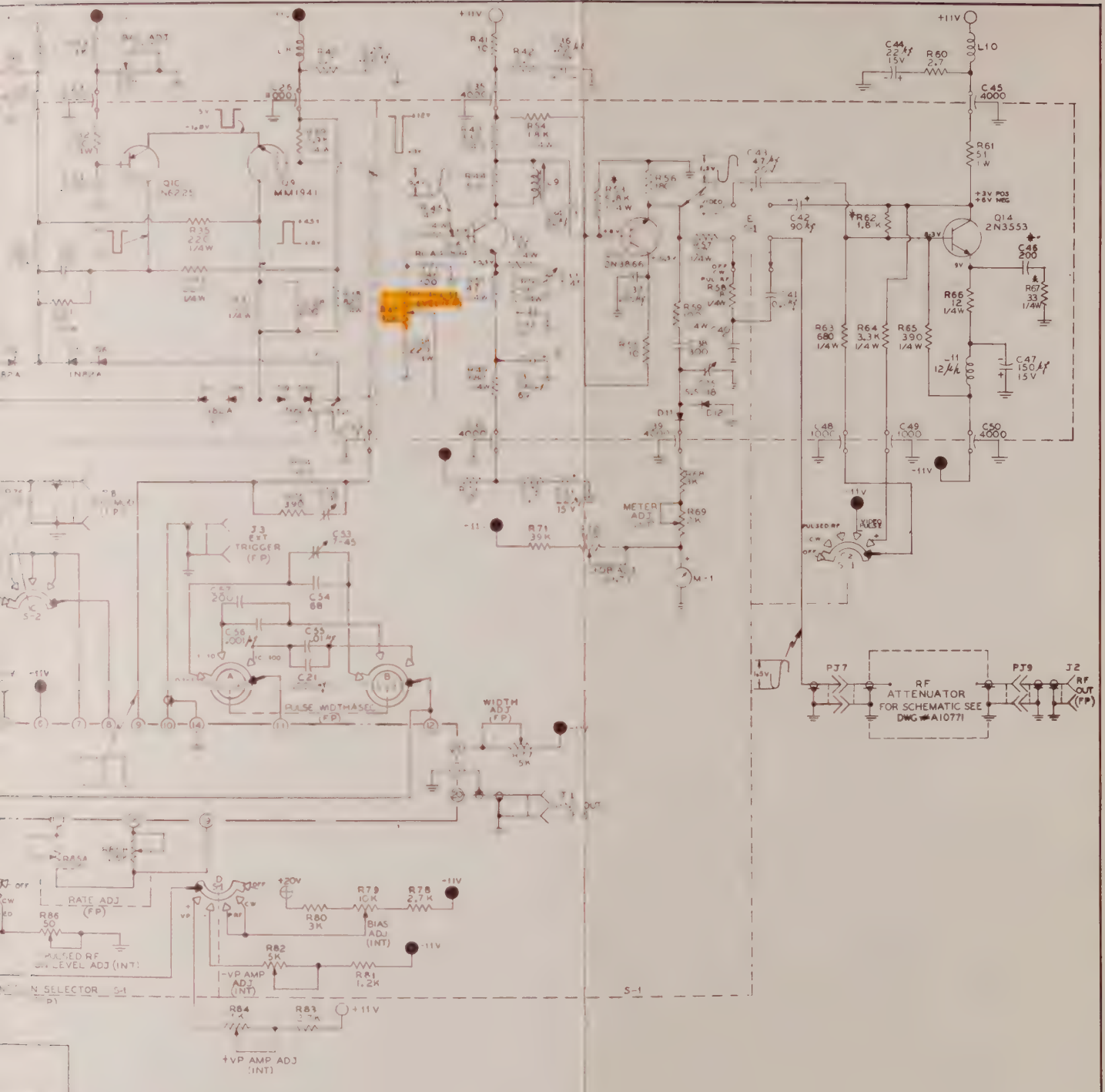
KAY ELEMETRICS CORP
PINE BROOK, N. J.

CHANGE	DATE	APP.
"B" ECNS 1126, 1137, 1140	9-21-66	
"C" ADDED C21 SCHEMATIC IS CHGD LOCATION OF E13 & E14 1/2W RESISTORS WERE 1/4W	2-25-69	R.N.B.
"D" CHANGED Q201 TO 2N3638A PER ECN 1550	8-1-72	
"E" Q202 WAS 2N2614 PER ECN # 1676	1-30-74	R.N.B.

DWN. BY A. RADER DATE 2-4-67
APP. BY [signature] DATE 6-1-67

DWG. NO. C 8039 E


FREQUENCY SELECTOR S-4
PJ6 (INT)
PJ5
J4 EXT OSC (FP)
L1
L2
L3
L4
L5
L6
C1 300
C2 .02μf
C3 4000
C4 4000
C5 470
C6 5
C7 3.5-31.5 (2)
C8
C9 5
C10 470
C11 4000
C12 4000
C13 .01μf
C14 4000
C15 2
C16 300
C17 4000
R1 68
R2 68
R3 68
R4 68
R5 100
R7 10
R8 100
R9 10
R10 10K
R12 2.2K
R14 2.2K
R15 10K
R16 100
R17 220 1/4W
R18 220 1/4W
R19 47 1/4W
R20 1.8K 1/4W
R21 18 1/4W
R22 220 1/4W
R23 220
R24 10
R120 470
Q1 2N3866
Q2 2N3866
Q17 2N3866
Q18 2N6225
D1 1N82A
D2 1N82A
-11V
+20V
PULSE RATE (FP)
S-2
P/C/B 8039
PULSE GENERATOR
FOR SCHEM SEE # C 8039
EXT TRIGGER
EXT MOD
INT
EXT
50-500
500-5K
C58 0.1μf
C59 .82μf
C60 .82μf
C61 0.1μf
R87 50
VIDEO PULSE
VIDEO PULSE ON LEVEL ADJ (INT)
R95 10
Q11 2N2270
R96 10K
R97 500
AGC ADJ (INT)
R98 1K
R99 2.2K
R100 100
Q12 2N3568
C62 0.2μf
R93 20K
R94 20K
Q13 2N3568
R92 9.1K
Q19 2N3568
R88 22K
R89 1K
R91 8.2K
R90 470
ALC AMPLIFIER
S-1
T-1
F1 1/2 AMP SLOW BLOW
I-1
P-1
FOR LINE VOLTAGE SEE NOTE BELOW
D13
D14
D15
D16
D17
D18
R101 5 5W
R102 390 1W
R103 240 1W
R104 20 10W
R105 10 2W
R106 27K
R107 22K
R108 5.6K
R109 1.2K
R115 10 5W
R116 91 1W
R117 91 1W
R118 5 5W
C63 1000μf 50V
C64 25μf 25V
C65 250μf 25V
C66 50μf 25V
C67 250μf 50V
C68 22μf 35V
C71 1000μf 50V
C72 25μf 25V
C73 250μf
C74 50μf 25V
D19 12V IN4742
D20 IN461
D21 IN4736 6.8V
D22 N936
D24 12V IN4742
Q21 2N1701
Q22 2N3740
Q5 2N2270
Q8 2N2270
Q20 2N1701
+33V
+24V
+12V
+11V
-12V
-24V
+22V
+10V
+9V
+36V
A WH/BLK
B BLACK
C BR/BLK
D BROWN
NOTE: (1) FOR 115V CONNECT WINDINGS IN PARALLEL - A TO C & B TO D
(2) FOR 230V CONNECT WINDINGS IN SERIES - B TO C



NOTE: UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/2W
ALL CAPACITANCES ARE IN μf
‡ FACTORY SELECT
④ INDICATES EGRESS HOLES
(FP) INDICATES FRONT PANEL
L9 — 6T #22

AUA #B2337

SCHEMATIC — RADA-PULSER, SR. 5070B

MAT. — FINISH: — SCALE: —

DIMENSION TOLERANCES UNLESS OTHERWISE SPECIFIED.
DECIMAL DIMENSIONS ± .005 FRACTIONAL DIMENSIONS ± 1/64

KAY ELEMETRICS CORP
PINE BROOK, N. J.

DWN. BY A. Rodgers DATE 5-1-67
APP. BY W. Newton DATE 5-1-67

DWG. NO. D9846 L

CHANGE	DATE	APP
K-Q9 WAS MC6401U per ECN# 1789	7/24	
L-R7 WAS 0.3 AMP FUSE per ECN# 1787	7/24	

CHANGE	DATE	APP.
B-per ECN NO 1148, 1157, 1160		
C-per ECN NO 1160		
D-ADD TRANSFORMER NOTE PER ECN # 1219		
E-added RF detail, schematic & width-adj note		
F-per ECN # 1234		
G-per ECN # 1237		
H-per ECN # 1652		
J-per ECN # 1676 (Q32 was 2N1183)		

SECTION IV

MAINTENANCE

4.1 ALIGNMENT PROCEDURE

Equipment Necessary

a. Sweep generator
b. CW oscillator
c. Oscilloscope
d. Frequency Counter
e. VTVM
f. External Detector
g. RF MIXER
h. Fractional Attenuator

A. POWER SUPPLY

NOTE: Test points for reading the power supply voltages are provided on the left rear corner of the amplifier box:

1. Using a VTVM, read between the +20 V test point and chassis ground and adjust the +20 V ADJ (R-113) for +20 V. B1 PWR XFMR ON TOP
2. Using a VTVM, check the +11 V test point for +11 V (-.5, +1.5 V).
3. Repeat Step 2 checking the -11 V test point for -11 V (-.5, +1.5 V).

B. PULSE REPETITION RATE

1. Using the output from the SYNC output jack, interconnect the 5070-B with and oscilloscope. An event counter may be used in place of the oscilloscope if one is available.
2. Place the 5070-B in the PULSED RF mode.
3. Adjust the pulse width controls for a 5 μ sec. width.
4. Using the PULSE RATE switch, check each range. See that the front panel RATE ADJ pot provides sufficient adjustment on each range.
5. The RATE RANGE pot (R-203 on Pulse Generator board) may be adjusted if the front panel controls do not provide sufficient range. ON S/I

C. PULSE WIDTH

1. Place the function selector switch in the + VIDEO PULSE position.
2. Adjust the repetition rate controls for the maximum rep rate.
3. Using the PULSE or RF OUT jack, connect the 5070-B to the oscilloscope using 50 ohm cable properly terminated.
4. Select the shortest pulse width range and see that the fine WIDTH ADJ covers this range.
5. If the range is not correct, trimmer C-53 may be adjusted to set the .1-1 ns range.

D. RF AMPLIFIER ALIGNMENT

1. Disconnect the 3" coaxial cable from the RF amplifier box.
2. Set the FUNCTION switch to the CW position.

3. Feed a 5 to 130 MHz swept frequency into the RF amplifier. This signal should be from a 50Ω source and approximately .9 V p/p.
4. Use the horizontal output from the sweep generator to drive the horizontal circuits of the oscilloscope.
5. The output of the 5070-B should be run thru an RF detector and into the vertical circuits of the oscilloscope.
6. Turn the RF or PULSE LEVEL control to maximum. An output of .5 V rms should be observed; if not, adjust the sweep generator output slightly.
7. Insert a fractional attenuator in the test system between the RF output and the oscilloscope.
8. Switch in .5 DB and note the level of the output.
9. Switch out the .5 DB and ascertain that the output is flat within the limits of ±.5 DB,
10. Maximum flatness may be obtained by adjusting trimmer C-33 and coil L-9 (located in the RF amplifier box). BIG CAP FLAT ON BOTTOM OF BOX MASSES LINES CONNECTED IT TO Q16 L9 ALSO CONNECTED TO Q16
11. R-44 may be selected to compensate for the high frequency end of the response. Increase the value of the resistor to raise the high end and decrease it to lower the high end.
12. Reconnect the 3" coaxial cable.

E. RF OUTPUT AND METER ADJUSTMENT

1. Switch the FUNCTION SELECTOR to the CW position.
2. The PULSE RATE selector may be set at any position except EXT. MOD.
3. Interconnect the 5070-B with an oscilloscope so that the output may be observed.
4. Adjust the AGC ADJ control (R-97) for a 1.5 V p/p output waveshape. ON TOP LEFT SIDE
5. Now feed the output thru an RF detector and into an oscilloscope.
6. Adjust the METER ADJ pot (R-69) for a .5 V reading on the front panel meter. ON TOP RT SIDE
7. Vary the FREQUENCY control through its range and observe the DC output. Trimmer C-75 may be adjusted to compensate any large deviations at the higher frequencies. IN RF BOX B VIDEO PULSE SWITCH
8. Now switch in 3 DB of fixed attenuation and note the output level.
9. Switch out 3 DB of fixed attenuation and turn the RF or PULSE LEVEL control down until the output equals the reference established in Step 10.
10. Repeat the entire procedure until any interaction of controls is eliminated.

F. PULSED RF OUTPUT

1. Set the 5070-B controls as follows:

FUNCTION SELECTOR	CW
PULSE RATE	EXT MOD
PULSE WIDTH	1 μs
BAND SELECTOR	EXT OSC

2. Connect the RF output to an oscilloscope.
3. Use BALANCE ADJ (R-34) and BIAS ADJ (R-79) to adjust for minimum observed "spikes" on the output. ON OUTSIDE OF RF BOX ON TOP LEFT SIDE MUST BE AT OTHERWISE GRND LVL
4. Note the level of the output, this will correspond to the "OFF" level.
5. Place the PULSE RATE switch in the 5 KHz position. Switch in fixed attenuation until

the output equals the level established in Step 4. BALANCE ADJ (R-34) is adjusted for maximum "OFF" level. SEE STEP 3

6. Switch the FUNCTION SELECTOR to the PULSED RF position and the BAND SELECTOR to the 10-24 MHz position.
7. Observe the shaping of the pulses; if the pulse has a slow rise time, C-15 (in the RF amplifier) may be selected to improve it. The PULSED RF ON LEVEL ADJ (R-86) may be adjusted to obtain a sharp "lagging" edge. ON TOP FRONT MIDDLE

G. RF HEAD ALIGNMENT

1. Set the 5070-B FUNCTION SELECTOR to the CW position.
2. Using the BAND SELECTOR coarse control, select the lowest band of frequencies.
3. Connect the RF output of the 5070-B to the input of an RF mixer. Feed the output of a signal generator into the other input of the mixer. The mixer output is connected to the input of an oscilloscope.
4. Note the level of the output, this will correspond to the "OFF" level.
5. Vary the fine tune control on the BAND SELECTOR until a "zero beat" is visible on the oscilloscope.
6. If the low frequency cannot be obtained, remove the teflon coil assembly from the turret and spread or compress the coils as necessary.
7. Adjust the signal generator for the highest frequency of the selected band.
8. If the high frequency cannot be obtained, remove the teflon coil assembly and adjust the two slugs.

   NOTE: Adjust the slugs an equal amount; if not the output waveshape may appear distorted.

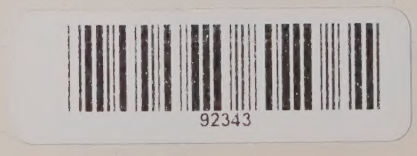
9. Repeat the above procedure for each band.

4.2 RESHIPMENT INSTRUCTIONS

If it is necessary to return the 5070-B to the factory for repair or calibration, it is suggested that the instrument be securely padded and packaged to prevent damage during shipping. A packing slip identifying the shipper, as well as the instrument type and serial number is also helpful. A statement indicating the particular malfunction may be included for the benefit of the factory service personnel.

4.3 PARTS REPLACEMENT

When making repairs on the 5070-B, exact replacement parts are suggested to insure satisfactory performance. These are available from the Kay Electric Co. When ordering parts please specify the instrument type, serial number, Kay drawing number and the Kay part number.


92343